

Power Of The Pyramids

Introduction:

To help project population numbers for different countries, demographers look at the profile of the countries' residents. What are the ages of the people? How many are men? How many are women? Taking this information, they construct "population pyramids" like the ones students will create in this activity. These graphs depict the configuration of a country's population as impacted by 70 to 80 years of economic, political and natural events. These graphs can also help predict future population trends.

Materials:

Student Worksheets (one per student)
Graph paper
Colored pencils
Ruler
Calculator (optional)

Procedure:

1. Display the sample world population pyramid on the next page and explain that this is a kind of graph used by demographers to study the distribution of people across age categories.
2. Explain to the students that the graph represents the entire world population, sorted by age and gender, with the youngest at the bottom and the oldest at the top. Each age level grouping is called a cohort. Ask the students:

Why do you think this type of graph is called a population pyramid?

(Because of its shape.)

What is the largest age cohort?

(0-4 year olds.)

3. Assign each student or group of students one of the six countries and distribute graph paper and a copy of the Student Worksheet for that country.
4. The figures on the worksheet represent the population (in thousands) of each age group within each gender for each particular country. In order to construct the country's pyramid, students must first calculate the percentage of the population of each gender in each age group.

Example: According to the worksheet, the total population of the United States in 2004 was 293,028,000. The population of males aged 0-4 was 10,334,000 of the United States.



Understanding
Population Dynamics

Concepts:

The age and gender distribution of a regional or national population affects its growth rate.

Objectives:

Students will be able to:

- ◆ Calculate percentages using raw numbers for each age/gender group in a given population.
- ◆ Construct a population age/gender distribution graph for one of six different countries.
- ◆ Make correlations between the shapes of the graphs and the countries' different growth patterns.

Subjects:

Math, Science, Social Studies, Geography, History

Skills:

Calculating percentages, graphing, analyzing and interpreting data

Method:

Students construct and interpret population pyramids and discuss differences in population growth rates among several different countries.

Example Problem:
$$\frac{10,334,000}{293,028,000} = .035 \text{ or } 3.5\%$$

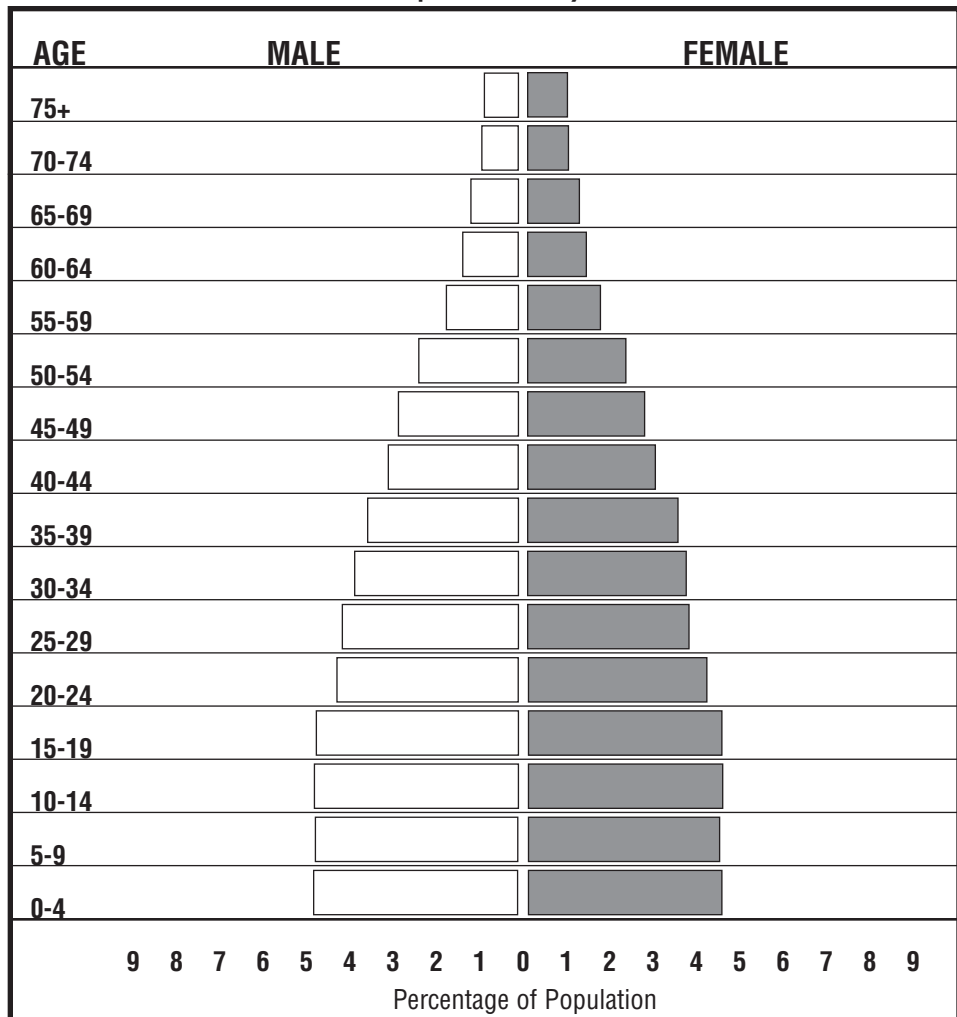
Students should complete these calculations for each cohort (age group).

- Using graph paper, students can construct a population pyramid as in the example. A line drawn down the middle of the graph separates the male and female populations. The percentages of the population will be plotted along the X-axis – females to the right, males to the left of the center line. The age groups will be running up the Y-axis with the youngest at the bottom, oldest at the top. (See “World Population Pyramid” sample.)

Note: Make sure the scale on the X-axis goes up to 9% in each direction to encompass everyone’s data.

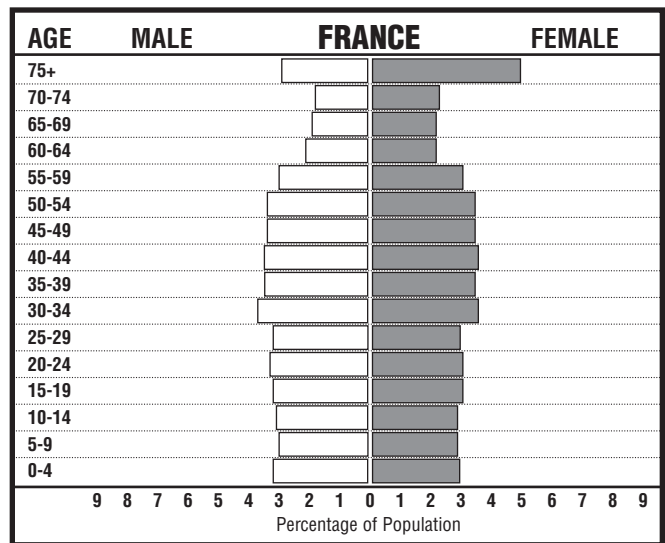
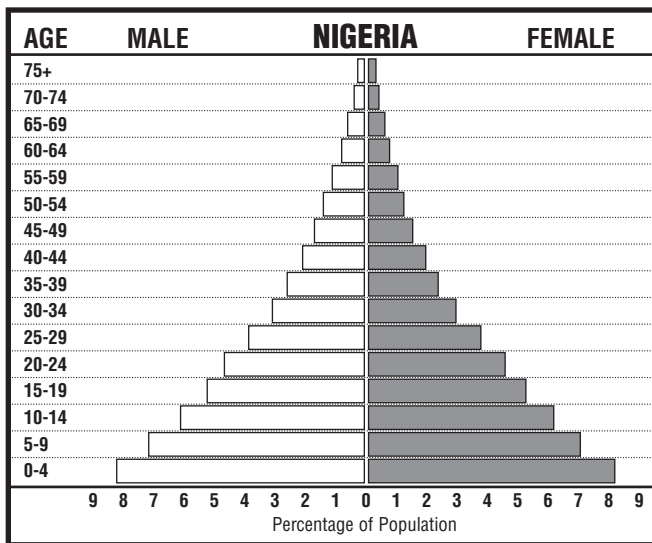
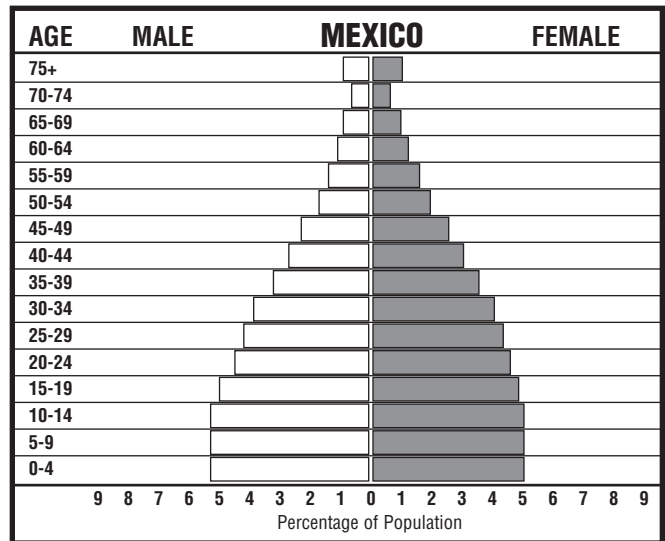
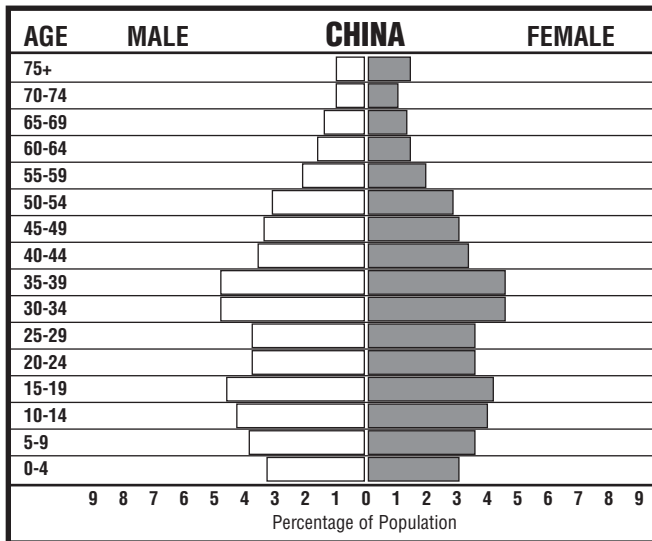
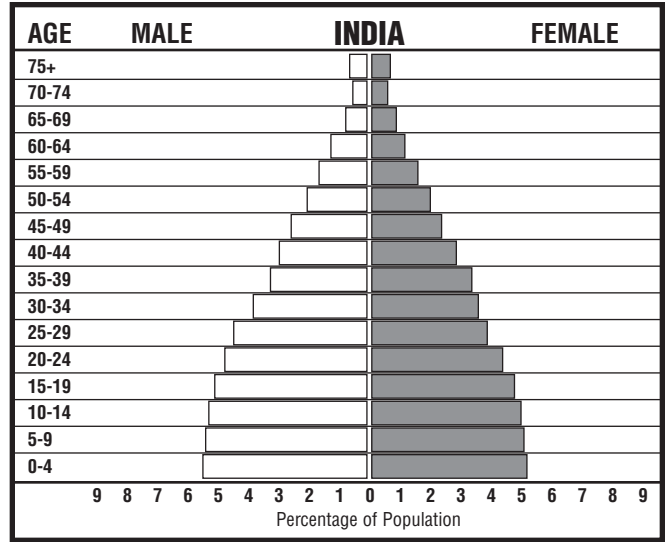
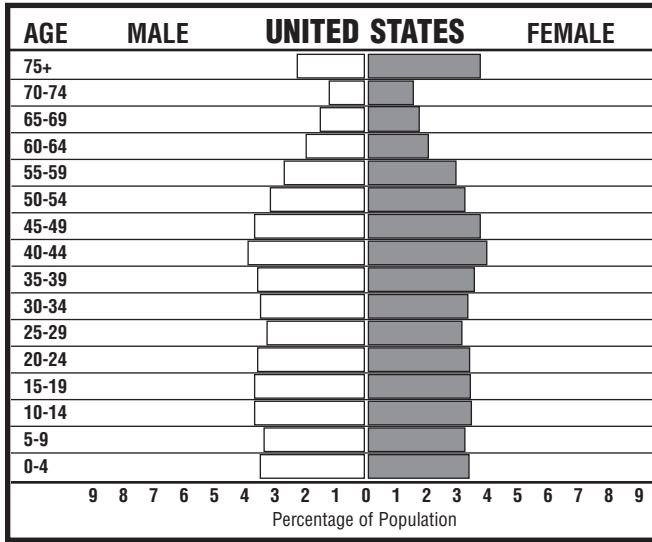
- Students graph the percentage data for their assigned country. Using colored pencils, they can shade in the two sides of their graphs.
- Students hold up their finished graphs for all to see while going through the discussion questions in class.

World Population Pyramid



POWER OF THE PYRAMIDS

Sample Pyramids





Discussion Questions:

1. Where are you represented on the Student Worksheet table and on the graphs?

If you live in the United States and are between 10 and 14 years old, you are represented on line 3 in the U.S. data under either male or female. On the graph, you and your cohorts make up the percentage presented by the third bar from the bottom, boys on the left, girls on the right.

2. Can you tell from the data if there are more boy babies or girl babies in each country?

There are more boy babies. There is a slightly greater probability of giving birth to male children. For every 100 girls born, there are about 105 boys born. Interestingly, the populations for each gender typically even out in subsequent generations, since boys are more susceptible to certain childhood illnesses.

3. Are there more elderly women or men? Why might that be the case?

There are more elderly women. Throughout the world, life expectancy for women is higher than for men, due to a number of genetic and social factors. In general, men are more predisposed to certain health risks than women. Also, men make up the vast majority of the military, and are more likely to die during wars. (Note that in several countries, the 75+ cohort is larger than the 70-74 cohort, because the 75+ cohort includes individuals age 75 until death. If that group was broken down into 5-year cohorts, we would expect that each successive cohort would be smaller.)

4. Can you tell from the graphs which country has the most people?

No. The graphs represent 100% of the population of each country broken down by age groups. Demographers use the percentage data instead of the raw data so that each graph fits on the same size paper and can be compared to the graphs of other countries.

5. Which country has the most people? How can you tell?

From the Total line on Student Worksheet #1, you can tell that China has more people than any other country.

6. Of the six graphs, which look most like pyramids? What does that indicate about their population growth rates? What factors would change the shape of the pyramids in the future?

The graphs for Nigeria, India, and Mexico look most like pyramids. This indicates a high growth rate. Population growth occurs when the segment of the population currently in its childbearing years (ages 15-44; bars 4-10 on the graphs) has produced a generation larger than itself (bars 1-3). If the birth rate goes down, this would change the shape of the graph over time from a pyramid to more of a rectangle, indicating a more stable population.

7. Looking at the pyramids, which country appears to have the slowest rates of population growth? How can you tell?

France has the slowest population growth. The graph is closer to a rectangle than a pyramid, showing more uniform population size across the age groups. France has a birth rate and death rate that are roughly equal, which demographers call "zero population growth."

8. Which are the two biggest age groups in the United States?

People aged 40-49 make up the biggest portion of the United States, with 10-19 year olds a close second. The people who were born between 1946 and 1964 are called "baby boomers," and were born shortly after World War II, when many husbands and wives were reunited, and the country experienced greater economic prosperity than it did during the years of the Great Depression and the war. Couples felt confident in their ability to support families, and the birth rate soared as a result.

9. In which countries do children make up the biggest percentage of the population?

You can see on the graph that the bottom of the Nigerian, Mexican, and Indian pyramids go out the farthest, representing the largest percentage. The percentages that you calculated show that Nigerian babies (males and females combined) make up almost 17% (8.4 + 8.2) of the population and the older children also make up a large percentage.

10. Some cultures have traditionally favored boy children over girl children (as can be seen in the pyramids for India and China). Why might it be advantageous to have boys rather than girls in these countries? What are some consequences that may arise if a generation has a gender imbalance?

Parents may favor boys over girls in order to carry on an ancestral line, to avoid the high costs of a daughter's dowry, or from the traditional belief that boys are more valuable. In developing countries, boys are expected to take care of their parents in old age, as girls will marry and live with the husband's family. As a generation matures, a shortage of girls leads to a shortage of women for men to marry. This condition can cause instability and result in kidnappings and violence towards women, massive migration of men seeking mates, the sale of women for marriage, etc.

11. If you had a business and wanted to capitalize on your information about the population age distribution for the United States, what would you sell?

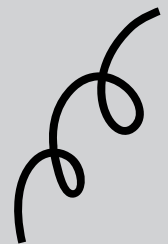
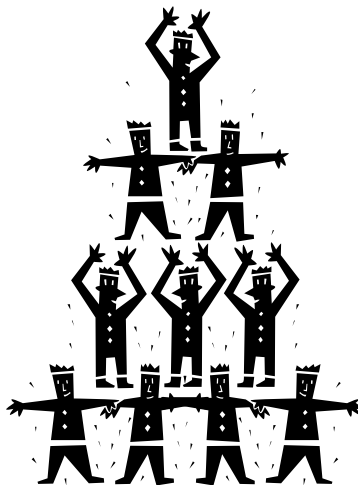
Answers might include any products for people of the baby boom generation or their children.

12. If you had a business in Nigeria and wanted to capitalize on your information about the Nigerian population, what would you sell?

Answers might include any products for children and infants.

13. How would you expect the Mexican pyramid to look if you graphed it in 40 years from now?

The graph shows that the Mexican population was growing rapidly until about 25 years ago, when the rate of growth slowed. If this trend continues unchanged, the Mexican "pyramid" will gradually become more rectangular.



Name: _____ Date: _____

Power Of The Pyramids – Student Worksheet #1

Population in Thousands (2004)												
Age Group	United States				Mexico				China			
	M	%	F	%	M	%	F	%	M	%	F	%
0-4	10,334		9,887		5,625		5,385		43,590		39,967	
5-9	9,981		9,533		5,647		5,417		51,046		46,629	
10-14	10,808		10,293		5,642		5,427		56,591		51,300	
15-19	10,702		10,148		5,325		5,218		60,146		55,292	
20-24	10,669		10,144		4,713		4,850		50,247		46,831	
25-29	9,834		9,517		4,427		4,620		49,990		47,469	
30-34	10,236		10,075		4,109		4,312		63,093		59,737	
35-39	10,503		10,467		3,449		3,816		63,017		59,497	
40-44	11,397		11,564		2,921		3,316		47,235		44,799	
45-49	10,900		11,204		2,429		2,762		44,497		41,381	
50-54	9,520		9,961		1,844		2,087		40,163		38,152	
55-59	7,993		8,499		1,511		1,708		28,037		26,312	
60-64	6,003		6,603		1,245		1,402		21,628		20,398	
65-69	4,624		5,321		959		1,099		18,439		18,033	
70-74	3,795		4,710		692		817		13,974		14,684	
75+	6,660		11,142		967		1,217		13,613		18,843	
Total	143,959		149,068		51,505		53,453		665,306		629,324	
Total	293,027				104,958				1,294,630			

Name: _____ Date: _____

Power Of The Pyramids – Student Worksheet #2

Population in Thousands (2004)												
Age Group	France			Nigeria			India					
	M	F	%	M	F	%	M	F	%			
0-4	1,948	1,853		11,503	11,303		58,639	55,647				
5-9	1,873	1,781		9,904	9,806		58,115	54,785				
10-14	1,903	1,812		8,578	8,528		57,116	53,572				
15-19	1,957	1,873		7,385	7,336		55,488	52,033				
20-24	2,007	1,924		6,564	6,448		52,019	47,211				
25-29	1,937	1,865		5,416	5,229		48,042	41,944				
30-34	2,232	2,169		4,360	4,139		42,046	39,041				
35-39	2,151	2,154		3,578	3,402		36,114	36,276				
40-44	2,128	2,174		2,939	2,770		32,001	31,367				
45-49	2,074	2,138		2,423	2,230		27,968	26,265				
50-54	2,066	2,117		1,971	1,872		23,291	21,639				
55-59	1,865	1,903		1,637	1,579		18,635	17,177				
60-64	1,280	1,346		1,229	1,199		14,183	13,336				
65-69	1,200	1,371		868	875		10,117	9,894				
70-74	1,100	1,398		577	596		7,222	7,172				
75+	1,749	3,071		499	507		8,547	8,270				
Total	29,470	30,949		69,431	67,819		549,543	515,629				
Total	60,419			137,250			1,065,172					

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Power Of The Pyramids – Answers to Student Worksheet #1

Population in Thousands (2004)												
Age Group	United States				Mexico				China			
	M	%	F	%	M	%	F	%	M	%	F	%
0-4	10,334	3.5	9,887	3.4	5,625	5.4	5,385	5.1	43,590	3.4	39,967	3.1
5-9	9,981	3.4	9,533	3.3	5,647	5.4	5,417	5.2	51,046	3.9	46,629	3.6
10-14	10,808	3.7	10,293	3.5	5,642	5.4	5,427	5.2	56,591	4.4	51,300	4.0
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45-49	10,900	3.7	11,204	3.8	2,429	2.3	2,762	2.6	44,497	3.4	41,381	3.2
50-54	9,520	3.2	9,961	3.4	1,844	1.8	2,087	2.0	40,163	3.1	38,152	2.9
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65-69	4,624	1.6	5,321	1.8	959	0.9	1,099	1.0	18,439	1.4	18,033	1.4
70-74	3,795	1.3	4,710	1.6	692	0.7	817	0.8	13,974	1.1	14,684	1.1
75+	6,660	2.3	11,142	3.8	967	0.9	1,217	1.2	13,613	1.1	18,843	1.5
Total	143,959	49.1	149,068	50.9	51,505	49.1	53,453	50.9	665,306	51.4	629,324	48.6
Total	293,027				104,958				1,294,630			

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Power Of The Pyramids – Answers to Student Worksheet #2

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10-14	1,903	3.1	1,812	3.0	8,578	6.2	8,528	6.2	57,116	5.4	53,572	5.0
15-19	1,957	3.2	1,873	3.1	7,385	5.4	7,336	5.3	55,488	5.2	52,033	4.9
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25-29	1,937	3.2	1,865	3.1	5,416	3.9	5,229	3.8	48,042	4.5	41,944	3.9
30-34	2,232	3.7	2,169	3.6	4,360	3.2	4,139	3.0	42,046	3.9	39,041	3.7
35-39	2,151	3.6	2,154	3.6	3,578	2.6	3,402	2.5	36,114	3.4	36,276	3.4
40-44	2,128	3.5	2,174	3.6	2,939	2.1	2,770	2.0	32,001	3.0	31,367	2.9
45-49	2,074	3.4	2,138	3.5	2,423	1.8	2,230	1.6	27,968	2.6	26,265	2.5
50-54	2,066	3.4	2,117	3.5	1,971	1.4	1,872	1.4	23,291	2.2	21,639	2.0
55-59	1,865	3.1	1,903	3.1	1,637	1.2	1,579	1.2	18,635	1.7	17,177	1.6
60-64	1,280	2.1	1,346	2.2	1,229	0.9	1,199	0.9	14,183	1.3	13,336	1.3
65-69	1,200	2.0	1,371	2.3	868	0.6	875	0.6	10,117	0.9	9,894	0.9
70-74	1,100	1.8	1,398	2.3	577	0.4	596	0.4	7,222	0.7	7,172	0.7
75+	1,749	2.9	3,071	5.1	499	0.4	507	0.4	8,547	0.8	8,270	0.8
Total	29,470	48.8	30,949	51.2	69,431	50.6	67,819	49.4	549,543	51.6	515,629	48.4
Total	60,419				137,250				1,065,172			

Follow-Up Activity

To give your students more practice analyzing age-sex distribution graphs, share with them the three examples below and lead a discussion using the following questions.

1. What are the dominant religions of Brazil and Iran? What effect would you expect these religions to have on those countries' birthrates? Looking at the graphs, what appear to be the current birthrate trends?

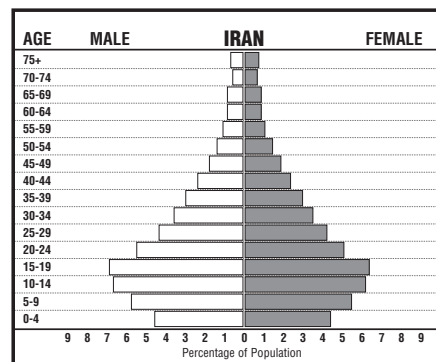
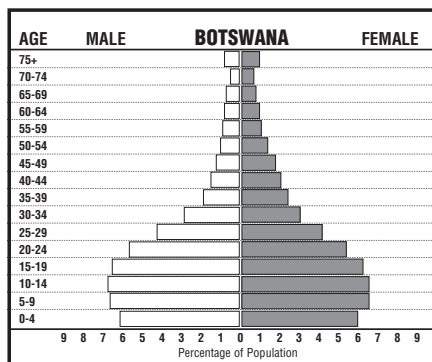
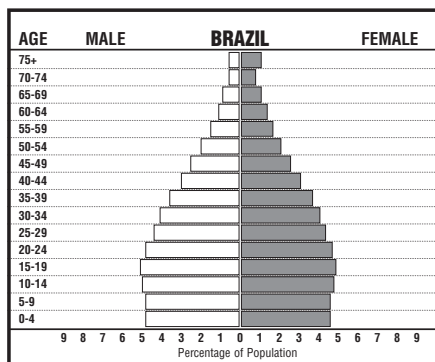
The population of Brazil is largely Catholic, while Iran's majority practices Islam. Historically, religious teachings in those countries would have discouraged modern family planning and encouraged large family size. Interestingly enough, the birth rates have been dropping in both countries in recent years, due in large part to more reproductive options available to women and men.

2. Almost forty percent of Botswana's population ages 15-49 is infected with HIV/AIDS. How would a reduced number of people in these cohorts affect a community?

Any community relies heavily on its people ages 15-49 for its workforce in important industries like education, healthcare and agriculture. If this workforce is missing, not only do these industries suffer, but also the people that rely on these industries. A lack of growth in industry can also stunt economic and political growth for a community as a whole. A high mortality in parents also produces a high number of orphans. Without adequate parental care, governments or charities may have to see to the needs of the community's youth. In many cases this is impossible due to other stresses on funding. It is important to note on the Botswana graph that the youngest age cohort is smaller than the three above it. This could be due to a reduction in the number of people having children or high infant mortality rates due to infected mothers passing HIV/AIDS to children during pregnancy.

3. Brazil's pyramid looks different than many of the other pyramids, what is the difference and how can you explain it?

Brazil went through a period of rapid population growth, with high birth and death rates, evidenced by the definitive pyramid shape of the upper part of the graph. The growth is slowing, as seen in the lower three cohorts, which are slightly smaller and indicate a shift towards a stabilizing population in the future.



Data source: United States Census International Database, updated annually by the United States Department of Commerce. Visit www.census.gov for further information.